Electric Vehicle Charging Demand Forecasting

Internship Project Report

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Abstract

This project focuses on analyzing and forecasting demand at Electric Vehicle (EV) charging stations. Using synthetic but realistic hourly data across multiple stations, the project combines time-series forecasting using Facebook Prophet in Python with interactive data visualization in Power BI to support data-driven infrastructure planning.

1. Tools Used

- **Python (Pandas, Prophet)** – data cleaning and forecasting
- **Power BI** – interactive visual dashboard
- **CSV** – for data storage and transfer

2. Steps Taken

2.1. 1. Dataset Creation

A simulated dataset was generated to mimic 3 months of hourly EV charging data (Jan–Mar 2024). It includes fields like timestamp, station ID, energy consumed, temperature, weather, and traffic levels.

2.2. 2. Data Cleaning & Feature Engineering

The dataset was processed using Python to:

- Convert timestamps
- Create features like Hour, Weekday, and Month
- Group and aggregate energy usage over time

2.3. 3. Forecasting with Prophet

We applied Facebook Prophet to forecast energy demand:

- Trained the model on hourly energy usage
- Generated a 7-day hourly forecast
- Exported predictions to CSV for visualization

2.4. 4. Power BI Dashboard

The forecast and actual data were visualized in Power BI using:

- KPI cards (total energy, peak hours, stations)
- Line chart for actual vs forecast demand
- Heatmap by hour and weekday
- Filters for date, station, weather, and traffic

3. Insights

- Peak charging occurs during weekday mornings and evenings.
- Station A3 has consistently high demand — ideal for infrastructure expansion.
- The Prophet model aligns closely with observed patterns and can be used for operational forecasting.

Conclusion

This dashboard supports decision-makers in identifying peak demand times, understanding the impact of weather and traffic, and planning future charger installations. The combination of Python modeling and Power BI storytelling offers both analytical depth and user-friendly visuals.